Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

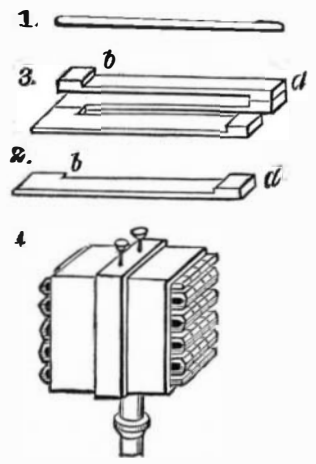
(1) C. L. writes: 1. In making induction coil (SUPPLEMENT No. 160) would it be of any advantage to wrap insulated wire (secondary) in two sections instead of across? A. Yes, the insulation need not be so perfect. You should use the same weight of wire as recommended in the SUPPLEMENT referred to. 2. Of what dimensions should it be to work electric pen (SUPPLEMENT No. 166), and would not a gravity battery answer better than a Grenet? A. A coil that will give a ⅛ (one eighth) inch spark will do. For continued use a battery composed of several gravity cells would answer very well. 3. I want to work a telegraph one hundred yards; shall I use ground connections or double wires? A. Use a return wire.

(2) J. K. asks: Which end of a horizontal cylinder receives the most steam? A. The piston rod end receives the least steam, and less work is done during that stroke.

(3) C. E. W. W. writes: I have not yet been able to find a cement entirely suitable for cementing rubber to wood: can you suggest something? A. 1. A good glue answers very well in some cases; the parts to be joined must, of course, be held well together while the glue is drying. 2. Melt together over a gentle fire equal parts of black pitch and gutta percha. If this is required to set very hard, one part of powdered shellac may be added. The addition of say a tenth part of caoutchouc clippings makes it more adhesive, but prevents in a measure its final hardening. This cement should be used hot.

(4) F. N. R.—The arrangement of copper lightning rods on the building, as you propose, will do very well, provided the bottoms of the rods are made to extend underground for a considerable distance, so that there will be a large conducting surface in contact with the earth. The common fault in lightning rods is that they are not sufficiently connected with the ground. They are generally stuck down two or three feet into dry earth; but such an arrangement is worse than useless; it is almost like placing the bottoms of the rods in a glass bottle. In all cases the bottoms of the rods underground should be connected with iron or water pipes, if they exist; or in lieu thereof, the rods should be extended a long distance underground, or should connect with a mass of old iron, or iron ore, or charcoal, or coal dust of any kind, laid in a trench. No lightning rod can be regarded as a safe conductor unless its lower extremity is carried deep into the ground, and there put in good connection with a large surface of conducting material.

(5) K. L. writes: With regard to Melloni's thermo-electric pile, one can read in books of physics sentences as the following one: "The thermo-multiplier consists of a series of small bars of antimony and bismuth, *a* and *b*, soldered together at their alternate ends." Well, this is all very nice, but the moment you come to put together those pieces of metal, all sorts of difficulties arise at once. 1st. You cannot get the bismuth to flow when melted; it is always in a kind of lump. 2d. The small piece of antimony is so brittle, that the moment you try to work it, immediately it falls into pieces. 3d. It seems impossible to solder them together. What is then to be done? A. The elements of the thermopile are made of antimony-glance and bismuth, cast in iron moulds and shaped with a file, as shown, full



size, in Fig 1. The bars of antimony must be tinned on both heads, *a b*, with very fusible solder by means of a small soldering iron. The bars of antimony and bismuth may be held together between spring forceps, and the spaces between the bars filled with pieces of wood, which may be allowed to remain to impart greater solidity to the pile, but they must not extend beyond the joints. The vertical rows of five pairs each are first soldered, and these are united when all of the pairs are complete. The end pieces of each row must have an offset at right angles to the bar, as shown in Fig. 2. Fig. 3 shows the combination of the end pieces of two vertical rows. When the pack of 20 or 25 pairs is completed, lay it in a round or square case of brass, having first soldered to the middle of the first and last bars short copper wires, which pass through two ivory lined holes in the case and are provided with permanent binding screws. The vacant spaces are then filled with plaster of Paris, which is afterward scraped away so as to leave the ends of the bars bare, and these are then blackened. In making this instrument a great deal of patience is required, as a breaking of a number of the bars is unavoidable.

(6) D. writes: Take a dozen or more sheets of blotting pad, size of your letter book. Dip every other one in water and put under press, wet and dry alternately, for a few minutes. Keep in tin box with lid, and use instead of wetting with brush. No need of oiled paper even after a little practice. Twenty or more letters can be copied at once as well as one, placing pad, tissue paper, letter, pad, tissue, at pleasure. One wetting will last several days.

(7) D. D. asks if black and white are colors in a scientific view. A. Black is the absence of color; white is the union of all colors.

(8) H. S H. writes: In your issue for March 8th, you tell D. J. C. (34), that you "do not think sunlight ever put out fire;" that "the difference in the heat of a fire with and without sunlight must be infinitesimal, if anything." I have repeatedly seen the brightest fire grow dull and cease burning when the full sunlight fell directly on the draught. The effect of the sunlight was the same as if some one had put water in the fire. In a west room at my father's house there was a stove so situated that the rays from the afternoon sun fell directly on the hearth, and unless the curtain was lowered the fire would almost cease to burn. This is the experience of many a housewife, and I with many others have often wished to know just why this was so. A. It is possible that the sun heat may in some slight degree affect the draught, but we are still of the opinion that the superior brightness of the sunlight renders the fire very dull by comparison, in much the same way as an electric light in proximity to a gas flame makes the latter appear of a deep orange color, whereas, before comparison with the electric light it would have been considered fairly white.

(9) H. J. B. asks: 1. What size balloon does it require to hold 10,000 cubic feet of ordinary street gas? A. The inflated bag should have a diameter of nearly 27 feet. 2. What weight is it capable of raising? A. About 340 lb., less the weight of the bag. 3. What would be about the cost of a balloon that size? A. Properly equipped, about $500.

(10) W. H. S. asks: 1. What part of a horse power would a small stationary engine, 3 inch stroke, cylinder 1½ inch bore, with a balance wheel 12 inches in diameter, be? A. See rule for calculating the horse power of engines on p. 267 current volume, query (4). 2. How large a boiler would it require to run the engine: the diameter and length? A. This will depend upon the pressure of steam you wish to carry and the number of revolutions per minute. 3. Could it be arranged to heat by kerosene or alcohol? A. Yes. 4. Which would be the best? A. Alcohol. 5. Please tell me how to arrange it to get the most heat with the least fuel. A. Arrange the lamp like any alcohol lamp, but with a sufficient number of wicks; it would be safer to have the vessel for alcohol at a distance from the lamp, like a German student's lamp.

(11) C. S. C. asks for the best method for making a soldering fluid for mending tinware without an iron. A. Dissolve zinc in muriatic acid until bubbling ceases, and add a quantity of water equivalent to that of the acid.

(12) "Investigator," writing of his father's experiment in treating wood some 40 years since, says: He buried in bituminous coal dust different descriptions of wood, and passed a current of hot steam through the pile; by this means he accomplished his intention even beyond his expectations. The wood became thoroughly imbued with the acid from the coal and shrank up to smaller proportions; the pores of the wood closed and became densely compact. The softer the fiber of the wood the more thorough the result, seemingly.

(13) S., B. & Co. ask if it will be possible to speak through a tube 400 to 500 feet long, running through the air (or on the outside of a wall), and of what material it would be best to make the tube of, iron or tin. A. Yes. Make the tube of tin, and have well rounded elbows.

(14) S. P. T. asks: Where would a person have to begin to study to be an engineer in the navy? A. At the Naval Academy at Annapolis, Md.

(15) B. writes: In your paper of the 12th of April, J. L. C., among other questions, asks: Will more water run through a one inch perpendicular pipe, 10 feet long, than through a one inch pipe, one foot long? Your answer is, Yes if they are even at the top and both taken from the same tank. Now why is more water forced into the long pipe, when the head or pressure is the same upon the opening of each? Please explain. A. There is a greater head on the 10 foot pipe than the one foot. The head is the height above the point of delivery, and not above the point of entrance to the pipes.

(16) G. McD. asks: In a B flat cornet which has the most friction, a piston or a rotary valve? A. Practically a piston valve.

(17) E. D. W. asks if there is any more danger from lightning on a telegraph line, in using bare copper wire for a ground from the lightning arrester, than in using insulated wire. A. No.

(18) R. T. C. writes: I wish to cut a piece of Iceland spar to a particular shape and polish it. Please inform me how I can polish the Iceland spar when I cut, so a ray of light will pass through it. I want it very smooth, as much so as a looking glass. A. You may cut it with a thin iron rotating disk supplied with emery and water, and you may polish it with a lap of copper charged with emery and water or emery and oil. Use different grades of emery, gradually increasing in fineness, and finally polish with a paste of putty powder, using a pewter lap.

(19) R. M. M. asks: 1. What books or papers must I procure in order to get a thorough knowledge of making ice by artificial means? A. Consult SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 85 and 91, and pp. 95 and 335, volume 37, and 159 and 387, volume 38, SCIENTIFIC AMERICAN. 2. Also, is there any process by which raw hide may be rendered impervious to water? A. We believe there are several patented processes which claim to accomplish this. Paraffine under pressure and in solution is claimed to satisfy the requirements.

(20) P. G.—For directions for removing superfluous hair, see volume 39, p. 75 (26), p. 91 (1) SCIENTIFIC AMERICAN.

(21) J. B. H. writes: I see in a recent number of the SCIENTIFIC AMERICAN, that J. P. J. asks you about building a scow to be run by a steam wheel. I have just finished the machinery for a scow 65 feet long, 16 feet beam, 3 feet draught of water. We put in a propeller wheel, 46 inches diameter, with a power of cylinder 8x12, with an upright boiler, 38 inches diameter by 78 inches high. She will carry about 28 cords of hickory wood, and make 6 to 7 miles per hour with 60 lb. steam. My experience is that the propeller wheel works better and with much less power than the old time steam wheels that we used to use down on the Ohio and Mississippi rivers.

(22) J. C. asks: What will remove the glossiness on cloth that appears on the knees and elbows of clothing after having been worn some time? A. There is no permanent remedy, since it is due to the wearing away of the "nap." A weak solution of ammonia will remove the gloss temporarily.

(23) W. K. asks: Can you inform me how to make cider in vinegar in a quick, wholesome way, or refer me to some number of your paper that has the process in? I have plenty of cider 6 years old that is very slow to make into sharp vinegar. A. Consult a General Treatise on the Manufacture of Vinegar, by Professor H. Dussauce (including all known quick processes). A full description of this process would occupy too much space in these columns.

(24) W. F. H. asks how to turn and fit a butterfly valve which has a solid stem running through the boss on valve. How to tell whether both ends of valve will fit before the sides are small enough. A. Cast on the valve a spindle which will coincide with the axis of the pipe to which the valve is fitted. Turn the valve to fit its seat, then saw off the cast spindle and fit in the spindle which is to support and move the valve, then fit the valve by filing or by turning off a very little from its sides near the spindle.

(25) I. C. McL. asks if there is any chemical that could be put into white iron to toughen it, that is, to put in the mixture when the iron is melted: if so what is it? We use this iron in the manufacture of bells. A. The toughness and hardness of iron and steel are increased by the addition of certain amounts of tungsten.

(26) C. E. L. writes: I frequently notice in your paper inquiries about ground connections on telegraph lines, and I think the subject is one that deserves more attention than is commonly given to it, as poor grounds are causes of more trouble to the amateur and inexperienced telegrapher than anything else. Current school text books describe a ground connection as a sheet of copper ten or twelve feet square buried at each end of the line. The expense of such a ground would in many cases be greater than the whole cost of wire and instruments, and of course it could not be thought of for an amateur line, where, as a general thing, expense is the first consideration. The best ground is a connec-

tion with a gas or water pipe; if possible it should be at a brass section of the pipe rather than an iron or lead, and it should be soldered when possible. The surface should be thoroughly brightened and the wire given ten or twenty turns around the pipe. In cases where a gas or water connection cannot be reached, a very good ground can in many cases be made by driving a rod of iron five or six feet into the ground; this will generally work well if the wire is soldered to it. A sheet of zinc or galvanized iron of say 10 square feet surface will answer every purpose if the soil is not too dry. It should be set in a vertical position. I have a galvanized sheet iron ground which has worked well for six years. In sections of country where the soil is shallow a greater surface will be necessary to make up for the lack of depth. I have made good grounds by soldering a number of old oyster cans to a wire, and by burying iron turnings and filings in a trench. A failure of any of these methods should not discourage, as it often happens that a change of a few feet in the location will find success.

(27) G. W. L. asks how to enamel paper tubes and packages to contain butter, lard, etc., and similar substances. A. A sirupy alcoholic solution of bleached shellac mixed with terra alba or other opaque harmless earth has been employed for similar purposes.

(28) H. M. J. asks how phosphor bronze is made. A. See p. 411 (30), vol. 39, SCIENTIFIC AMERICAN.

(29) R. & T. write in answer to W. M. M., query No. 23, page 203, current volume of SCIENTIFIC AMERICAN: It is necessary for a practical man to have the mill stone before him and to know what quality and quantity of work is required of the same, also to see the grain to be ground; because of the many different circumstances controlling the millstone, it is impossible to lay down any fixed rule for a stone, as we are governed solely by conditions, and as such, milling is not a science but an art, and must, therefore, be handled to suit circumstances and conditions.

(30) D. J. W. asks for a receipt for making a blue writing ink that can be made in small quantities, say ½ gallon, of these qualities: color bright blue, will not settle or thicken on exposure to the air, and flows freely. A. Coupier's blue, also known by the name of indulin, dissolved in water in the ratio of 20 parts to 1,000 of water, forms a writing ink of a good color, which it retains when treated with chemical agents. It does not corrode steel pens. Anything added to ink to prevent evaporation also tends to prevent it drying when written with. Replace the water lost by evaporation occasionally.

(31) W. H. H. asks: 1. Will ordinary coal lose a part of its weight by being exposed to the air and sun? A. Yes, if it contains much moisture and sulphides. 2. If it does, what per cent of its weight will it lose? A. It depends upon the amount of moisture, sulphides, etc., present in the coal, and the conditions, time, etc., of exposure.

(32) H. L. writes: I have a good deal of trouble with my lard, which I work every day in the hot weather: it gets sour very often. Can you suggest anything that will keep lard sweet? A. In hot climates a small quantity of calcium sulphite is sometimes used, a few grains to the ounce.

(33) D. W. C. writes: In your issue of March 29, page 203, W. M. M. asked: "In laying off a millstone in furrows, what draught is given; what amount of the space of a stone is given to furrows and what to grinding surface?" The draught of the furrows of millstones should be in proportion to their diameters, that is, to give stones of different diameters equal draughts, the distance of their furrows from the center must be in direct proportions to their diameters. A stone four feet in diameter, the draught of the leading furrows should be two inches from the center of the stone, and all other small furrrows should be parallel to the leading furrows; the whole surface of the face of the stone should be given to furrows, to form edges; because the principle of grinding is that of shears clipping; the furrows serving as edges to cut the grain; therefore, it is plain that the more cutting edges the stone has, the faster it will grind. The best dress that I have put on a stone is laid off in this form: divide the face of the stone into sixteen leading furrows; then divide the sections of the stone into as many straw furrows as possible. These straw furrows should be very narrow, and be made parallel with the leading furrows.

(34) C. M. D. writes: Please inform G. M. A., in "Answers to Correspondents," that he can get a very good and durable coat of brown on his gun, by allowing it to get covered with salt spray and letting it rust for a day or two, after which he must rub off the loose rust and give the barrel a couple of coats of oil.

(35) S. B. G. asks: 1. Should a violin be left in tune when laid away? A. Yes. 2. At what angle to the axis of the wheel should the wings of a wind power be set? A. The mean angle should be from 15° to 17° from the plane of rotation of the wheel. 3. If a small log be split into halves or quarters it will spring outward, and appears as though the heart side is longer than the bark side. What is the cause of it: does the wood of the bark side contract, or does the wood of the heart side lengthen? A. The moister sap wood probably contracts most on exposure to the air.

(36) J. H. asks: 1. What kind of wax or varnish is used in etching on steel with nitric acid? A. Beeswax or paraffin. 2. What parts of a locomotive are called the journals? A. The cylindrical parts of the axles, which revolve in the boxes. 3. A friend of mine has been disputing with me about governors: he says that they are all self-regulating, while I claim that the engineer has to judge from the speed of the balls. A. All governors are intended to be automatic or self-regulating.

(37) W. S. W. asks: 1. Can a young man get enough knowledge of locomotive engineering by hard study, to materially lessen the time required on an engine as fireman? If so, what time would it require and what books would you recommend? A. Yes. "Bourne's Hand Book of the Steam Engine," and "Forney on Locomotives," and "Reynolds' Locomotive Engine Driving." 2. How long should a young man, who has a taste for the business, fire a locomotive before being qualified for promotion to engineer? A. It depends upon his intelligence, application, and observation. 3. What traits of character are required in order to become a good locomotive engineer? A. System; habits of close observation; readiness of resource; a cool head, and great presence of mind. 4. Is there any difference in the power of two locomotives of equal weight, one having 4 and the other 6 drivers, the drivers to be of the same diameter? A. No, if friction is not considered. 5. What is about the average weight of American locomotives? A. 36 to 35 tons.

(38) C. B. asks: 1. Have any vessels been constructed to go under water? A. Yes; Fulton constructed one, and in the early years of the late war there were at least two successfully operated in New York harbor. 2. Have any electrical engines of one horse power or more been invented? A. Yes, there have been many made of small power. You will find descriptions of both of them in the back numbers of the SCIENTIFIC AMERICAN.

(39) B. F. asks: Does it take any more power to force a column of water through 1,000 feet of pipe on an inclined plane and raise it 70 feet than it does to force a column through 70 feet perpendicularly? A. Yes, by the amount of friction of the increased length of pipe required.

(40) J. D. asks: What size wire cable was in use at the hauling off the steamship Americus into deep water at the time she was stranded on Long Branch Beach, and also what power engines were in use on her to get her off? A. No wire rope used, but four 18 inch hemp cables, with blocks and falls from the cables to the drum of the ship's hoisting engines.

(43) M. O. D. asks: 1 Do you know of any materials that are preferable to infusorial earth and wrought iron turnings for use in a vessel for filtering drinking water? Will it answer to mix them together in one mass? A. Well burned granular charcoal is in many cases preferable to iron in such a filter. You will find an excellent article on the purification of drinking water on p. 414 et seq., Science Record for 1874. See also p. 346, vol. 39, SCIENTIFIC AMERICAN. For the purification of water containing much organic matter, Dr. Crookes recommends the addition in the proportion of from one to two parts of the following mixture to every 1,000 parts of the water: Permanganate of lime, 1 part; sulphate of alumina, 10 parts; fine pipe clay, 30 parts; intimately mix. After settling for 15 minutes the water can be drawn off from the sediment without filtering. 2. Is there any objection to a brass vessel tinned inside? A. Yes, wood is preferable. 3. Are tinned iron wire screens objectionable; how fine should the mesh be? A. Stout cotton cloth will be found more serviceable, and is less objectionable. 4. Will the same filtering materials answer for boiler feed water? If thoroughly cleaned once a day how long a time will the filtering materials last? A. It would depend much upon the water.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

L. S. S.—21. A green trap rock, contains pyrite, quartz, and garnet. 22. Similar to No. 21 with serpentine. This sample contains traces of gold.—J. C.—Apatite, calcium phosphate, containing more or less calcium chloride and fluoride.—E. H. A.—Fossiliferous limestone.—C. I.—Arsenical pyrites in talcose slate. It contains traces of gold.—J. R.—No. 1. Chiefly hornblende and calcite containing graphite (plumbago). No. 2. To get the value of mineral specimens you should address some dealer in minerals.—E. E. C.—The bead is composed chiefly of lead. It contains a trace of silver.

COMMUNICATIONS RECEIVED.

On the Whirlpool. By T. P. R.
On Consumption. By R. R. G.
On the Autopsy of an Elephant. By A. J. H.
On the Destruction of Insects. By F. L. J.
Removing Stains. By J. C. W.

[OFFICIAL.]

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Mangles, C. Reese, Baltimore, Md.
Railways, elevated, C. Donkersley, New York city.
Refrigerating rooms, G. H. Hammond, New York city.
Sewing machines, J. Bigelow, Philadelphia, Pa.
Spinning machinery, J. C. Todd, Paterson, N. J.
Tool handle, H. D. Justi, Philadelphia, Pa.
Transmitting motion, ———, Stamford, Conn.
Try squares, L. S. Starrett, ———, Mass.
Weighing machine for skins, D. T. Winter, Peabody, Mass.